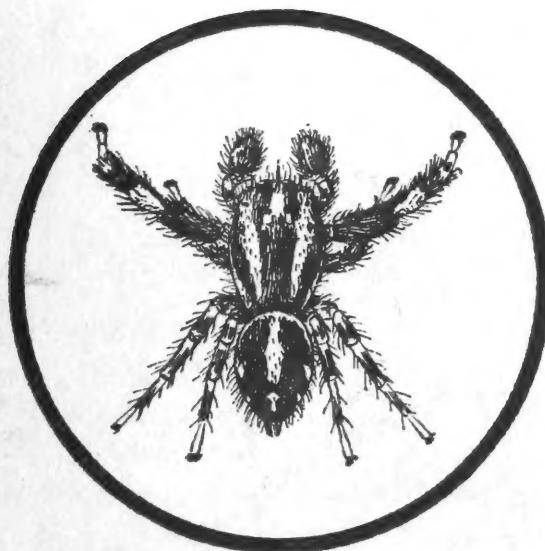


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ANNUAL REPORT
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MUSEUM OF
COMPARATIVE ZOOLOGY

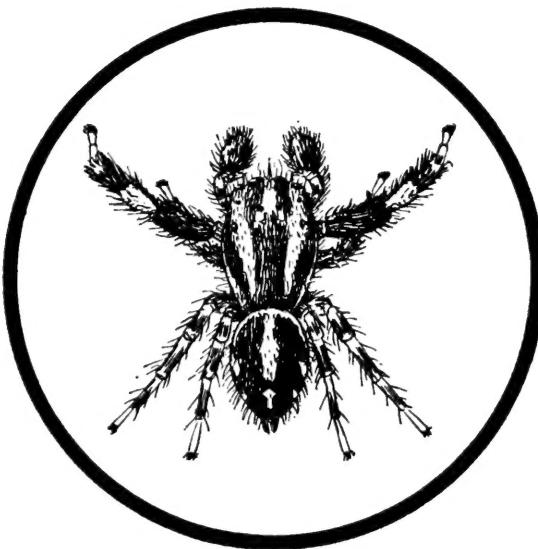


HARVARD UNIVERSITY



ANNUAL REPORT
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Pellenes agilis Banks. Drawn by J. H. Emerton.

HARVARD UNIVERSITY
CAMBRIDGE, MASS.
1965



MUSEUM OF COMPARATIVE ZOOLOGY

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CHARLES PEIRSON LYMAN, PH.D.
ALFRED SHERWOOD ROMER, PH.D., S.D. (hon.).

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FRANK MORTON CARPENTER, S.D., *Alexander Agassiz Professor of Zoology and Curator of Fossil Insects.*
PHILIP JACKSON DARLINGTON, JR., PH.D., *Alexander Agassiz Professor of Zoology.*
BRYAN PATTERSON, A.M. (hon.), *Alexander Agassiz Professor of Vertebrate Paleontology and Professor of Vertebrate Paleontology.*
ALFRED SHERWOOD ROMER, PH.D., S.D. (hon.) *Alexander Agassiz Professor of Zoology and Curator of Vertebrate Paleontology.*
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HOWARD ENSIGN EVANS, PH.D., *Curator of Insects.*
HOWARD BARRACLOUGH FELL, PH.D., D.SC., *Curator of Invertebrate Zoology.*
BERNHARD KUMMEL, PH.D., *Curator of Invertebrate Paleontology.*
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JOHN FRANCIS LAWRENCE, PH.D., *Assistant Curator of Insects.*

WILLIAM ANDERSON NEWMAN, PH.D., *Assistant Curator of Marine Invertebrates.*

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BENJAMIN SHREVE, *Research Associate in Herpetology.*

RUTH DIXON TURNER, PH.D., *Research Associate in Malacology and Alexander Agassiz Fellow in Oceanography and Zoology.*

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IRA RUBINOFF, PH.D., *Research Fellow in Ichthyology.*

CHARLES RICHARD TAYLOR, PH.D., *Research Fellow in Mammalogy.*

BARRY ROBERT WILSON, PH.D., *Research Fellow in Malacology.*

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ARNOLD DAVID LEWIS, *Chief, Department of Preparation.*

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WILLIAM CHARLES SCHROEDER, *Honorary Associate in Ichthyology.*

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GEORGE WILLIAM COTTRELL, JR., A.B., *Associate in Ornithology.*

JOHN HOLMES DEARBORN, PH.D., *Associate in Marine Zoology.*

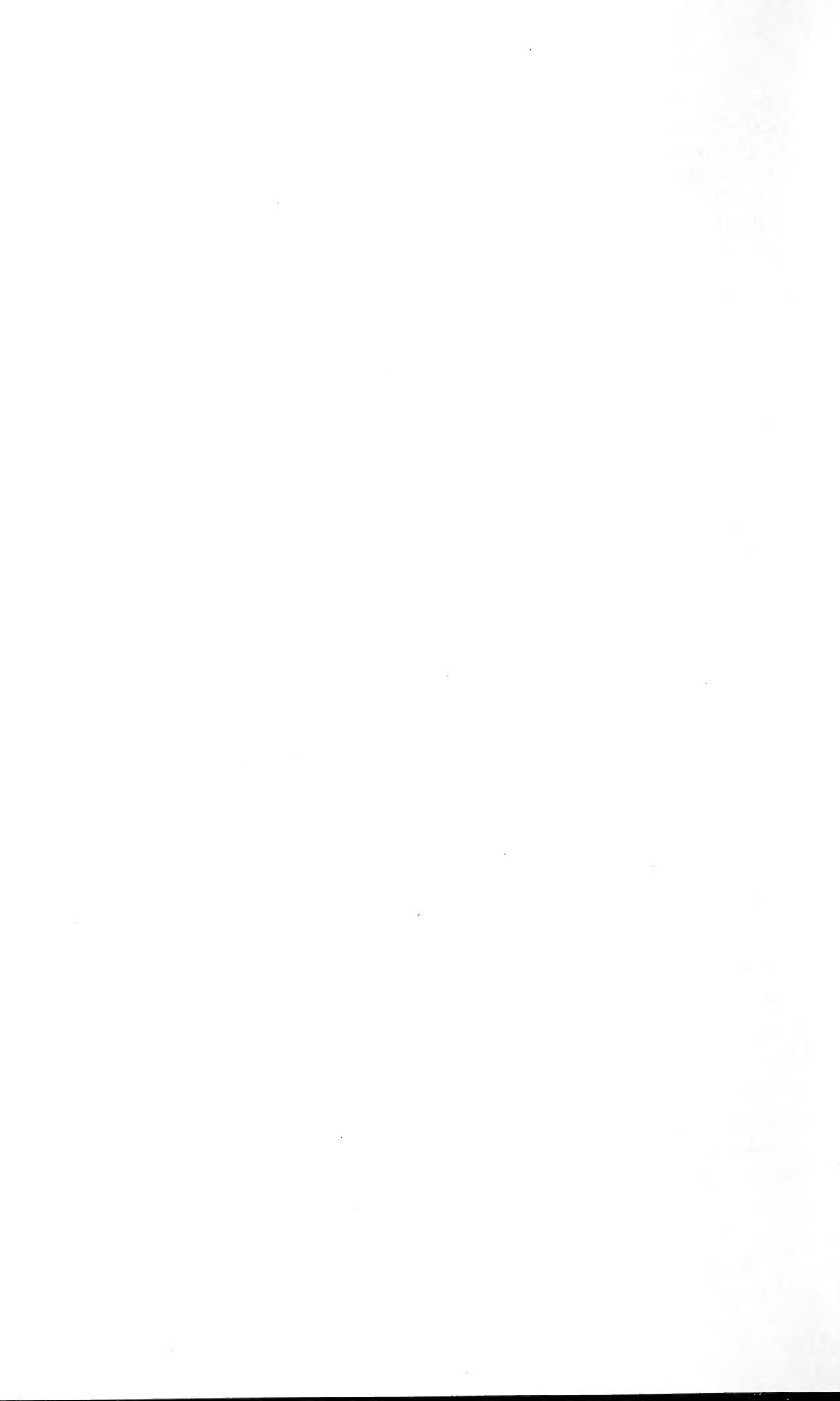
RICHARD DEAN ESTES, PH.D., *Associate in Vertebrate Paleontology.*

ALEXANDER GRAHAM BELL FAIRCHILD, PH.D., *Associate in Entomology.*

THOMAS HENRY FRAZZETTA, PH.D., *Associate in Herpetology.*

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JAMES COWAN GREENWAY, JR., A.B., *Associate in Ornithology.*
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NORMAN BERTRAM MARSHALL, M.A., *Associate in Ichthyology.*
EDWARD HARLAN MICHELSON, PH.D., *Associate in Mollusks.*
GEORGE MITCHELL MOORE, PH.D., *Associate in Mollusks.*
NATHAN WENDELL RISER, PH.D., *Associate in Mollusks.*
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ROBERT RAKES SHROCK, PH.D., *Associate in Invertebrate Paleontology.*
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RICHARD WAINWRIGHT THORINGTON, JR., PH.D., *Associate in Mammalogy.*
GARTH LEON UNDERWOOD, B.SC., *Associate in Reptiles and Amphibians.*
THEODORE ELMER WHITE, PH.D., *Associate in Vertebrate Paleontology.*
EDWARD OSBORNE WILSON, PH.D., *Associate in Entomology.*



MUSEUM OF COMPARATIVE ZOOLOGY

REPORT OF THE DIRECTOR

Teaching and research activities have expanded considerably this year. We record with particular pleasure two new appointments, which will ensure a vigorous revival of this Museum's activity in marine biological research and instruction: Dr. H. Barraclough Fell, as Curator of Invertebrate Zoology; and Dr. William A. Newman, as Assistant Curator of Marine Invertebrates. Dr. Fell is a noted authority in the field of echinoderms; Dr. Newman is an authority on barnacles, coral reefs and biological oceanography.

STAFF

New associates include: Allen R. Brady, Arachnology; Ira Rubinoff, Ichthyology; and Charles R. Taylor, Mammalogy.

Tilly Edinger, Research Paleontologist, and an eminent authority on fossil brains, retired on June 30th, but will continue her affiliation with the Museum as an honorary associate.

We record with regret the death of James W. Chapman, Associate in Entomology since 1951, in his 84th year.

Of awards and honors received by staff members, the following may be singled out for mention: Professor Darlington was elected to the National Academy of Sciences; Professor Mayr, an honorary member of the Asociación Ornitologica del Plata (Argentina); Professor Romer, a corresponding member of the Bayerische Akademie der Wissenschaften. Dr. Romer also received a Ph.D. (honorary) from Lehigh University. Dr. Elisabeth Deichmann was

awarded the Order of Knight of Dannebrog from the King of Denmark, for her scientific work and for promoting cultural relations between the United States and Denmark; and Dr. Tilly Edinger received the degree Dr. med.h.c. from the Johann Wolfgang Goethe Universität at Frankfurt, Germany. Dr. Fell was elected a Fellow of the American Academy of Arts and Sciences; Dr. Paynter, a Fellow of the American Ornithologists Union, as well as a Corresponding member of the Asociación Ornitológica del Plata.

As customary, staff members served many national and international societies or organizations as officers or as members of committees. During the past year, for instance, the Director was active on some twenty committees and boards, including the Divisional Committee in Biology and Medicine (National Science Foundation), and the Panel of Biological Sciences of the U.S.-Japan Scientific Cooperation Committee, of which he was Chairman. Professor Romer served as President of the XVI International Congress of Zoology; Professor G. G. Simpson as President of the Society of Systematic Zoology, and beginning in 1964, as President of the American Society of Zoologists. Professor Whittington is Vice-President of the Paleontological Society, and Professor Kummel is Treasurer. Dr. Edinger is serving as President of the Society of Vertebrate Paleontology.

TEACHING

The scientific staff continued its active participation in instruction. Course offerings included: Biology 40 (Clench, Newman, Lyman); Biology 127 (Carpenter); Biology 129 (Lyman, Patterson, Mead, Paynter and E. E. Williams); Biology 132 (E. E. Williams); Biology 149a, b (Levi); Biology 239 (Newman); Biology 250 (Mayr); Geology 151 (Whittington); Geology 250 (Kummel); Geology 256 (Kummel); Geology 258 (Whittington); Natural Sciences 10 (Kummel). Research courses were offered by Carpenter, Clench, Darlington, Deichmann, Evans, Kummel, Miss

Lawrence, Levi, Lyman, Mayr, Mead, Newman, Patterson, Paynter, Romer, Simpson, Whittington, and Williams. Individual lectures by staff members were given in various other undergraduate courses such as Natural Sciences 5, Natural Sciences 6, Natural Sciences 10, Biology 124 and Biology 247. In addition, Professor Darlington and Dr. Turner also participated actively in instruction at Harvard.

The following students, doing their basic research in the Museum, were awarded Ph.D. degrees: Allen Brady, Guy Bush, Laurence DeMott, Allen Hunt, Allan Ormiston, Ira Rubinoff and Richard Thorington, Jr.

Weekly graduate student teas for MCZ students and staff continued.

During the summer, Dr. Mead taught a course in ichthyology at Stanford University, Hopkins Marine Station; and Dr. Newman collaborated in teaching "Advanced Invertebrate Zoology for Museum Personnel" at Yale University.

As in other years, many staff members were invited to give lectures at congresses, conferences and seminars, including the International Zoological Congress (August 1963), the Centennial Meeting of the National Academy of Sciences in Washington (October 1963), and the International Union of Biological Sciences Symposium on the Genetics of Colonizing Species, Pacific Grove (February 1964).

EXPEDITIONS AND TRAVEL

Field research again took students and staff to all corners of the world. Worth noting are expeditions by Professor Patterson to East Africa; by Miss Lawrence to Anatolia, Turkey; and the participation of Dr. Mead and Mr. Foster in the Indian Ocean expedition aboard the R/V Anton Brunn.

Scientific collections were studied by almost all staff members at natural history museums abroad and in this country. A major part of the funds for field and museum research was made available by the National Science Foundation and

the National Institutes of Health. Their generous support is gratefully acknowledged.

For their aid in connection with the African expedition sincere thanks are due to Dr. and Mrs. L. S. B. Leakey and to Mr. Brian Baker, Commissioner, and Mr. John Walsh, Geologist, of the Mines and Geological Department of the Kenya government.

RESEARCH

Activities of the staff have centered around research in evolutionary biology. How did the enormous diversity of life on this world evolve? What are the mechanisms, the causal determinants, and the environmental conditions? The importance of evolutionary research has, if anything, increased in recent years—comparative biochemistry and molecular biology utilize to an increasing extent the findings of phylogenetic research. The following summary indicates the many highly diverse directions staff members have taken in their research but it cannot do full justice to the extent of these activities nor can it mention all of them. Publications listed at the end of this report will provide further information.

Taxonomy

It is as true today as it was 200 years ago that sound taxonomy is the indispensable basis for all research in zoology and botany. Recognizing this fact, almost all of our staff members have devoted at least part of their time to basic taxonomic researches from the species level on up.

Professor Carpenter is nearing completion of his insect volume for the Treatise on Invertebrate Paleontology. It is certain to be the standard reference work on fossil insects for many decades to come. The volume gives a complete treatment of fossil insects at the generic level; much of it, particularly in the case of Paleozoic and Mesozoic insects, is based on original revisions and an examination of types.

The magnitude of the task is indicated by the fact that 1100 illustrations had to be especially prepared. Professor Carpenter has also completed research on several fossil insect faunas, such as the Carboniferous of Commentry, France, and of North America, and the Permian of Oklahoma and Kansas. This has led to recognition of many previously undescribed fossil types, as well as to a more correct understanding and, in some cases, reclassification of previously known forms. What is emerging is an appreciation of the astonishing variety of insect types which were already in existence in Paleozoic times and their many similarities in adaptive radiation to modern kinds of insects.

Revisions of marine, freshwater and land mollusks are being continued by Dr. Clench. A report on the genus *Pedipes* and on the South American and West Indian members of the Volutidae continues his long series of monographs on the marine mollusks of the Western Atlantic.

Dr. Evans completed his revision of the genus *Rhabdepyris*, probably the most generalized group of the large subfamily Epyrinae (Bethylidae). No less than twenty-seven of the forty-one species in this genus of uncommon wasps turned out to be new. Also completed was a revision of the Mexican and Central American spider wasps of the subfamily Pompilinae. Fully ten of the thirty-nine genera and subgenera occurring in North America are restricted to Central America, Mexico, and the extreme southwestern United States, chiefly in the arid regions. Distribution of the approximately 150 species has been plotted and made the basis of a discussion of the origin of the Central American fauna.

In collaboration with Dr. David L. Pawson of the U.S. National Museum, Dr. Fell has found evidence based on the skeletal morphology of fossil and Recent echinoderms for a direct relationship between the fossil edrioasteroids and living sea cucumbers. These results show that a reappraisal of the broad classification of echinoderms is needed.

Work on various collections of echinoderms is now in progress.

Dr. Levi completed his work on neotropical theridiid spiders and has begun the first of a series of revisions of argyopid spiders in the family Araneidae. He continued his research on poisonous spiders and is publishing his discovery that a Mediterranean *Steatoda* is poisonous to guinea pigs, mice, and presumably other mammals. In Dr. Levi's laboratory, Dr. Allen Brady continued revision of the Central American lynx spiders; and Dr. Paolo Tongiorgi, on a year's leave of absence from the University of Pisa, Italy, revised the numerous Italian species of *Pardosa* (wolf spiders) with particular attention to the difficult group of *Pardosa monticola*.

Dr. Newman has continued his research on burrowing barnacles. From his collection made in Puerto Rico, a species of *Balanus* was found inhabiting the stinging coral *Millepora* which had been reported only once before in the more than hundred years since Darwin first described it. The new analysis shows that the species actually belongs with the bell barnacles, rather than with the coral-inhabiting forms to which it is presently assigned. Dr. Newman is also working on a deep-sea barnacle of the genus *Utinomia*, recently dredged from deep water by H. Sanders and R. Hessler, of the Woods Hole Oceanographic Institution. It is not only the first deep water acrothoracican so far discovered, but it is also the most primitive species known in this group of cirripeds. This is another indication of the interesting discoveries still to be made in the ocean, particularly in the deep sea.

A study of the elephant shrews and a comparison of them with the most primitive primate relatives, the tree shrews, has been made by Professor Patterson. He has found good evidence that the former are not particularly related to the tree shrews but deserve to be recognized as a distinct order that arose in Africa early in the Tertiary. Research into the extinct South American family Archaeohyracidae reveals

that it is closely related to the Hegetotheriidae and should be included in the suborder Hegetotheria of the Notoungulata.

Dr. Paynter continued his work on the Emberizinae and completed a study of the *Zonotrichia* group. Research into the generic characters of this group showed that many of the familiar "sparrows," including the Song, Fox and White-throated Sparrows, which have long been treated as belonging to different genera, are more properly considered a single genus. He is also continuing his research on the Harvard-Yale bird collections from India, Nepal and Pakistan.

Professor Simpson completed a revision of the African fossil Lorisoids, which include the lorises, pottos and bush babies, are one of the three major surviving groups of pre-monkeys (prosimians). They are of special interest because they represent the most primitive stage of primate evolution which eventually gave rise to man. Except for a single tooth from India, all known fossil lorisoids are from Africa and all are included in this study. Lorisoids prove to have been at least as varied and abundant in Africa in the early Miocene as they are today, and not notably more primitive at that time.

Dr. Williams undertook a study of the South American members of the lizard genus *Anolis*. A surprise finding was that the Amazonian fauna is relatively poor (less than ten species or superspecies) while areas with more topographic variety, such as Colombia and Costa Rica, have thirty or more species. A study of the gecko genus *Gonatodes* showed that species are remarkably stable with respect to their scale characters, while head and body proportions, as well as the color pattern of the males, quite easily permit recognition of a number of well defined species. Dr. Laurent completed his revisions of African reptiles and amphibians with particular attention to geographic variations in the frog *Hyperolius marmoratus* and the gecko genus *Holodactylus*.

Faunistics and Stratigraphy

It is now generally recognized that the "working out" of a collection so characteristic of the early period of taxonomy is not the most rewarding procedure. This is the reason for the emphasis on generic and family revisions indicated in the above survey of taxonomic research. Nevertheless, there are special circumstances when faunistic research is rewarding. This is particularly true in stratigraphy, where the analysis of a local fossil fauna often leads to a significant advance in our understanding of the past history of the earth.

Dr. Kummel conducted a series of illuminating stratigraphic researches. They centered around the problem of the Permo-Triassic boundary in the Salt Range of West Pakistan and around the distribution of the Triassic cephalopod faunas. In collaboration with Dr. Curt Teichert he established for the first time the sequence, nature, and spatial relations of the lithofacies of the Permo-Triassic boundary in the classic area of the Salt Range. An analysis of the Triassic ammonoid faunas of this area resulted in a drastic revision of the standard sequence for the lower Scythian, and a considerable revision of our concepts concerning the rate and pattern of evolution of the ammonoids during that period. In another investigation, Dr. Kummel analyzed a very interesting ammonoid fauna from Afghanistan which has been turned over to him for study by Dr. H. K. Erben, of the University of Bonn in Germany. In other studies, he is concerned with Triassic ammonoid faunas from Thailand, from New Zealand, and from the eastern Mediterranean. His primary research project is a synthesis of the paleobiology and geology of the Scythian (Lower Triassic). This encompasses a critical study of every ammonoid taxon described and recorded for that period. About 400 plates and 100 line drawings have so far been prepared. A first, outstanding result has been the establishment of the extraordinarily cosmopolitan character of the fauna. Appreciation of this fact has profound biological, paleogeographic and

climatic implications and will influence our interpretation of this and other ancient faunas.

Dr. Whittington completed a monograph on the Ordovician trilobites from the Table Head Formation in Newfoundland, a particularly rich (66 species) and excellently preserved fauna. The species occurring in dark shale and limestone are different from those in the nearby contemporaneous white limestone formation of Lower Head. Both faunas belong to the American bathyurid province and are very different from those in European rocks of the same age.

Professor Simpson completed revision of an important early Eocene mammalian fauna from Patagonia in the Tournouër collection of the Muséum National d'Histoire Naturelle in Paris. Apart from the fact that these previously undescribed or inadequately described specimens add significantly to our knowledge of that fauna, the collection is of particular interest because it includes the type material on which the important Casamayoran stage in South American stratigraphy and mammalian history was originally based by Gaudry.

Faunistic studies on living faunas were conducted by several staff members. Dr. Clench analyzed the mollusks found at an archeological site in Russell Cave National Monument in northeastern Alabama. The earliest inhabitants (7000 years B.C.) obtained their molluskan food nearby and did not even range as far as the Tennessee River (about 7 miles away). At higher levels (up to 1650 A.D.) the Indians did reach the river but apparently remained in a small area since they did not obtain any of the upstream species.

Dr. Williams continued work on the reptilian fauna of Bougainville. Its affinities appear to be partly Australian, partly New Guinean and partly with the Pacific islands. The proportion of endemics is lower than in the West Indies. The reason appears to be that the families dominant in the Solomon Islands, the Gekkonidae and Scincidae, are exceptionally good water crossers. Mr. Shreve has worked

on some small collections from Colombia and French Guiana which included new species and several new subspecies.

Dr. Mead and Mr. R. L. Haedrich completed a distributional analysis of a high-seas fish (*Brama brama*) of potential commercial interest, determining larval distribution, changes in seasonal abundance and correlation with ocean temperatures. The analysis was based on collections made by the Danish "Dana" expeditions and on Spanish fishery statistics.

Zoogeography

Zoogeographic studies have held great fascination for members of the Museum since the days of Louis Agassiz; and we have been in the forefront of zoogeographic research during recent decades.

Professor Darlington has completed his book on the biogeography of the southern end of the world. By putting together new evidence from geophysics, geology, paleontology, and paleomagnetism, he has come to the conclusion that the southern continents were more closely grouped together in the late Paleozoic and located farther south than they are now. Africa and South America were probably united at that period, but separated not later than the early Mesozoic. In other words, they were separated so long ago as not to leave any distinct impact on the distribution of living faunas. The book will be published by Harvard University Press.

Dr. Kummel continued his studies of the zoogeography of marine faunas during the Lower Triassic. Dr. Newman made comparative studies of barnacle faunas from the Pacific, the Caribbean and other tropical oceans, showing that relationships in some cases are far closer than hitherto accepted.

Professor Mayr attempted to reconstruct the Tertiary history of the American bird fauna. Although birds as a whole were able to cross rather easily the extensive water gap which separated North from South America throughout the later Mesozoic and most of the Tertiary, he found that twenty-three families of birds are nevertheless good zoogeographic indicators. Of these, twelve are apparently origi-

nally southern, six are northern, while five families have crossed the water gap repeatedly and in both directions. Professor Mayr further investigated the properties of successfully colonizing species of birds and found that such species have several or all of six characteristics. He has also analyzed the concept fauna, and this has shown that faunas cannot be fully understood unless the component faunal elements are separated. Six kinds of faunas can be distinguished depending on kinds of isolation, colonization, and subsequent adaptive radiation.

A review of the zoogeography of the southern continents was completed by Professor Simpson. Apparently the three continents are dead ends for terrestrial animals, and each, in varying degree, has been isolated from the rest of the world. The present composition of the faunas of these continents can be understood only in terms of these historical factors. Also completed by Professor Simpson was the first of a planned series of papers on the zoogeography of Recent North American mammals. This study deals with species density (number of species per unit area) over the whole continent especially as patterned by density contours. It marks the first time species density has been studied on a large scale, in fully quantitative terms, in an effort to establish its continental pattern. This pattern seems to be the result of an interplay of at least four different factors. Three of these (correlation with vertical relief, longitudinal trend, and peninsular poverty) have not previously been abstracted, and the fourth (tropical diversity) proves to be more complex than had previously been thought on the basis of more limited and less quantitative studies.

Dr. Turner was able to prove, in a study of material found in planking removed from the "Bounty II," that shipworms were and still can be distributed great distances by wooden ships. The discovery of a startling new species of *Anolis* from the mountains of Puerto Rico permitted Dr. Williams to reassess the distributional history of this genus. It now seems probable that the port of entry was east of Hispaniola

as had already been suggested by some of the West Indian rodent evidence.

Anatomy and Morphology

Miss Lawrence completed (with Mr. Schevill) a detailed analysis of the gular musculature of porpoises, and has begun a series of studies on the variation of the postcranial skeleton in different genera of European artiodactyls. Professor Patterson has found that the internal carotid artery of the extinct South American marsupial carnivore *Cladosictis* achieved essentially a condition considered typical for placental mammals. This finding reinforces doubts raised by other recent authors as to the usefulness of the carotid system as a character indicating the relationship of higher mammalian taxa.

With the help of microtome sections and the construction of wax models, Dr. Whittington studied some particularly well preserved graptolites from Newfoundland. This has greatly clarified our views on the relation of some previously obscure genera and permitted discussion of structural detail with European specialists. Dr. Turner continued her investigations of molluskan anatomy, including work on the genera *Megalacron* and *Rhytidococoncha* of the subfamily Papuinae, and of genera in the marine families Volutidae and Naticidae. She also continues her work on the Teredinidae. This has revealed far more fundamental differences in ship-worms than had been previously realized, and as a result several of the genera of Teredinidae had to be redefined. There is now need to follow up the anatomical work with physiological and ecological studies, in order to determine the functional value and selective significance of the differences.

Physiology and Population Biology

Dr. Lyman is concentrating on the peculiar sensitivity of hibernating animals to acetylcholine, the chemical mediator between nerve and muscle. His data indicate that this sub-

stance is essential for arousal from hibernation and plays an important role in the periodic arousals which occur in all hibernators. Studies of DNA synthesis during hibernation seem to indicate that cell replacement continues, but at a slow rate, and that one phase of the mitotic cycle proceeds at a slower rate than any other. The result may be an eventual synchronization of all dividing cells in the hibernating animal. Dr. Lily Tashima demonstrated for the first time that the thyroid of a hibernator (hamster) exposed to cold was hyperactive, but that the gland was inactive during hibernation. Prior to this clear-cut evidence, it was believed that hibernators differed from other mammals in not reacting to the stress of cold by increasing thyroid activity. The anatomy and physiology of blood flow in the horns of bovids was studied by Dr. Taylor. He found evidence that heat loss from the larger horned bovids was of sufficient magnitude to be of survival value under heat stress.

In studying the adaptive significance of tail lengths in rodents, Dr. Thorington demonstrated experimentally that the length of tail in one species of *Peromyscus* depends in part on the environmental temperature to which it is exposed during growth. He also showed that the vascularity of the tail in many rodents is so patterned that an efficient counter-current exchange of heat takes place, thus reducing heat loss through the tail during cold stress.

Behavior

Study of animals in their natural surroundings, particularly the various aspects of behavior, continues to be of special interest to many members of the staff. Dr. Evans is bringing to conclusion a review of the comparative ethology and evolution of the sand wasps (Hymenoptera, Nyssoninae). The most primitive sand wasps are small and slender-bodied insects, exhibiting very simple nesting behavior and preying upon leafhoppers; from these have evolved an array of large, stout-bodied wasps, which prey upon adult insects with complete metamorphosis, and exhibit a great variety of



Left to right: Michael Dix, Dr. Paolo Tongiorgi, and Dr. Allen Brady gathering wolf spiders on Gulf Coast of Florida during a field trip to collect snakes and spiders.



Rhino jaw in fossil quarry discovered north of Loperot in Turkana, Kenya, by the expedition of 1964.

specializations in their nesting behavior. There are so many parallelisms in structure and ethology within this group that a final synthesis has proven rather difficult. However, it is possible to trace the evolution of certain specific behavior patterns by comparison of various groups (e.g. cell cleaning behavior, construction of false burrows, predatory behavior, etc.).

Dr. Mead continued his studies of the biology of deep-sea fishes. Mr. Schevill, in his work on the adaptation of aquatic mammals to their environment, has given special attention to the underwater sounds of cetaceans. He is also studying "recognition features," that is, characteristics that seem to identify individuals in a group, or features that are characteristic for species, genera and even families. Most of this research is being carried out at the Woods Hole Oceanographic Institution.

General Systematics and Biological Concepts

Professor Simpson completed a collection of essays, some revised and some new, on the principles, nature and importance of evolutionary biology, its place among the sciences, its philosophical import, etc. It has been published as *This View of Life*. Revision of *Life*, a book on general biology, was completed in collaboration with Dr. W. S. Beck of the Harvard Medical School. Professor Romer has devoted most of his time to a complete revision of his world renowned standard text, *Vertebrate Paleontology*. Owing to the great activity in this field during the past two decades, not only analysis of a very large quantity of literature was required but also consultation with numerous specialists. Professor Mayr prepared a facsimile edition of the first edition of Darwin's *Origin of Species* (1859), including an up-to-date subject index and an introductory essay on Darwin, his antecedents, and his impact on man's intellectual history. He is also continuing his analysis of taxonomic theory and practice, which was started last year.

This sampling of staff research can only inadequately

picture the breadth of interest displayed and the number of lines of research still in progress. Very few of the activities of our numerous graduate students and associates are mentioned and no reference is made to efforts of the staff in reviewing books and in popular writing. Some of this is reflected in the attached bibliography.

Preparation

The importance of the Preparation Department to research has not been stressed sufficiently in recent annual reports. In most groups of organisms, it is necessary that the collected material be properly prepared before it can be scientifically evaluated. This is true for vertebrate skeletons, for most insects, and most of all for fossil specimens. Material brought back as a result of a single summer's activities may require the joint efforts of several people for more than a year, before the fossils are properly freed from the matrix. Each kind of matrix may require a different technique. Research is going on in this area to determine the most efficient technique for various materials. For instance, our Preparation Laboratory has been trying since 1958 to find a method of preparing fossils encased in ironstone. With the help of Harvard's Chemistry Department, a method has now been worked out whereby hydrofluoric acid is applied in combination with hydrochloric. Use of these dangerous materials has required installation of an acid hood and other facilities, but preparation of the extraordinarily interesting Argentinian collection has been greatly speeded up. Other new techniques being worked out include improvements in the old peeling and etching techniques, as well as the replacement of plaster by plastics for the casting of specimens. We now have three good casting plastics that exceed plaster for lightness, and two hardeners which are acid proof.

PUBLICATIONS

Publications of finished research include some 100 titles and approximately 2,743 pages. Among the more extensive

efforts were: *This View of Life*, by G. G. Simpson; Volume 10 of *Peters' Check-list of Birds of the World*, E. Mayr and R. A. Paynter, Jr., (eds.); and *Wasp Farm*, by Howard Evans.

Museum publications totalled 1,370 pages, and included the "Bulletin" (Volume 129, No. 8 through Volume 131, No. 8), 17 numbers of "Breviora," and a special publication, *Phylogeny and Evolution of Crustacea*.

Details of all publications are recorded in the appended bibliography.

COLLECTIONS

Systematic collections are one of the finest research tools in evolutionary biology. Much as we stress the role of the MCZ as an idea center we must not forget that the collections are to a considerable extent the raw material out of which the ideas emerge. Of almost equal importance is the continuing improvement in their organization. We are continually striving to increase the efficiency with which they can be used by students and researchers.

Again this year significant additions have been made to the collections, and the active field work of last summer will result in still further enrichment. Mention can be made here of only the largest and most significant of these contributions. Through the efforts of Richard Foster, Mrs. Ruth Ostheimer and Dr. Arthur Humes, we received 2,400 lots of mollusks from several localities in Madagascar, 1,000 lots from the Cook Islands and over 600 lots from the Fiji Islands. Large groups of Carabidae and Hymenoptera were received from Luis E. Peña of Chile. Our outstanding ant collection is steadily being augmented, particularly through the efforts of Professors E. O. Wilson and W. L. Brown. Dr. Fell's collection of New Zealand and Pacific echinoderms has been deposited in the Museum. Our ammonoid group has been considerably enriched by exchanges, as well as by gifts. The herpetological collections were enlarged particularly by materials received from Australia and the Papuan region, South America and the West Indies.

LIBRARY

The Library is participating in a University project which will result in a complete listing of all scientific serials currently being received by all the Harvard libraries. This will be a most useful library tool. Because it has become unwieldy and vexing to use, the pamphlet collection of about 22,500 pieces is being considerably reduced. All duplicates, reprints and numbers of journals are being removed from the collection and will be housed in the various departmental libraries. Library holdings have been increased by 3,886, bringing the total number of volumes and pamphlets to 257,392.

EXHIBITS AND MUSEUM SHOP

The popularity of our Museum Shop is gratifying indeed, and modest profits continue to help finance our program of educational exhibits. The exhibit program is moving ahead in a satisfactory manner. Plans have been drawn for a modern version of the Invertebrate Paleontology Hall, and work has started on three of the exhibit units.

ACKNOWLEDGMENTS

We are grateful to our many interested friends and associates who have made valuable additions to our collections, have voluntarily given of their time, and have made significant contributions to our resources.

We are particularly indebted to the following:

For major additions to our collections: H. K. Erben, H. Barraclough Fell, Richard W. Foster, Douglas Gardner, Edgar Grossman, Edwin G. Hicks, Horton H. Hobbs, Arthur Humes, Richard I. Johnson, Ruth Ostheimer, Luis E. Peña, and the Geology Department of Hamilton College.

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ERNST MAYR
Director

PUBLICATIONS FOR THE YEAR 1963-1964

BREVIORA

No. 187. The labyrinthodont dentition. By John Newland Chase. 13 pp. July 10, 1963.

No. 188. Redescription of some cavernicolous pseudoscorpions (Arachnida, Chelonethida) in the collection of the Museum of Comparative Zoology. By William B. Muchmore. 16 pp. 8 figs. July 29, 1963.

No. 189. Notes on amphisbaenids (Amphisbaenia; Reptilia). 10. Redescription and redefinition of *Amphisbaena pericensis* Noble from the mountains of northwestern Peru. By Carl Gans. 15 pp. 8 figs. August 29, 1963.

No. 190. Characters and synonymies among the genera of ants. Part III. Some members of the tribe Ponerini (Ponerinae, Formicidae). By William L. Brown, Jr. 10 pp. September 30, 1963.

No. 191. Three new species of *Mangora* (Araneae, Argiopidae) from Central America. By Arthur M. Chickering. 11 pp. 15 figs. December 5, 1963.

No. 192. A redescription of *Dinopis longipes* F.P.-Cambridge, 1902 (Araneae, Dinopidae). By Arthur M. Chickering. 6 pp. 4 figs. December 5, 1963.

No. 193. A Miocene toad from Colombia, South America. By Richard Estes and Richard Wassersug. 13 pp. 5 figs. December 5, 1963.

No. 194. A new subspecies of *Tropidophis greenwayi* from the Caicos Bank. By Albert Schwartz. 6 pp. 1 fig. December 31, 1963.

No. 195. Cayman Islands *Tropidophis* (Reptilia, Serpentes). By Richard Thomas. 8 pp. 3 figs. December 31, 1963.

No. 196. A new genus and species of bathypelagic ophidioïd fish from the Western North Atlantic. By Daniel M. Cohen. 8 pp. 2 figs. December 31, 1963.

No. 197. *Anolis whitemani*, new species from Hispaniola (Sauria, Iguanidae). By Ernest E. Williams. 8 pp. 4 figs. December 31, 1963.

No. 198. *Amphisbaena schmidti*, a third species of the genus from Puerto Rico (Amphisbaenia: Reptilia). By Carl Gans. 11 pp. 7 figs. March 10, 1964.

No. 199. A new subspecies of *Varanus exanthematicus* (Sauria, Varanidae). By R. F. Laurent. 9 pp. 5 figs. March 10, 1964.

No. 200. An anguid lizard from the Leeward Islands. By Garth Underwood. 10 pp. 4 figs. April 10, 1964.

No. 201. Food habits and young stages of North Atlantic *Alepisaurus* (Pisces, Inomi). By Richard L. Haedrich. 15 pp. 2 figs. April 10, 1964.

No. 202. The blind snakes (*Typhlops*) of Haiti with descriptions of three new species. By Neil D. Richmond. 12 pp. 4 figs. April 10, 1964.

No. 203. A new capromyid rodent from the Quaternary of Hispaniola. By Clayton E. Ray. 4 pp. 1 fig. April 10, 1964.

No. 204. The status of *Pseudogekko shebae* and observations on the geckos of the Solomon Islands. By Walter C. Brown. 8 pp. 3 figs. May 15, 1964.

BULLETIN

VOL. 129

No. 8. A review of the Recent freshwater limpet snails of North America (Mollusca: Pulmonata). By Paul F. Basch. 63 pp. 20 figs. July 8, 1963.

No. 9. Studies on South American anoles. Description of *Anolis mirus*, new species, from Rio San Juan, Colombia, with comment on digital dilation and dewlap as generic and specific characters in the anoles. By Ernest E. Williams. 18 pp. 3 figs. Aug. 2, 1963.

No. 10. American spiders of the genus *Theridion* (Araneae, Theridiidae). By Herbert W. Levi. 109 pp. 13 pls. Aug. 30, 1963.

VOL. 130

No. 1. Notes on the *Chamaeleo bitaeniatus* complex. By A. S. Rand. 29 pp. Sept. 27, 1963.

No. 2. Morphology, paleoecology, and phylogeny of the Permo-Pennsylvanian amphibian *Diploceraspis*. By James R. Beerbower. 78 pp. 15 figs. Nov. 15, 1963.

No. 3. A review of the North American Tertiary Sciuridae. By Craig C. Black. 140 pp. 22 pls. Dec. 20, 1963.

No. 4. A revision of the genus *Apenesia* in the Americas (Hymenoptera, Bethylidae). By Howard E. Evans. 111 pp. 10 pls. Dec. 20, 1963.

No. 5. Rhinoceroses from the Thomas Farm Miocene of Florida. By Horace E. Wood, 2nd. 26 pp. 5 pls. Jan. 31, 1964.

No. 6. A revision of the *punctatus* group of African *Typhlops* (Reptilia: Serpentes). By R. F. Laurent. 58 pp. 9 figs. Jan. 31, 1964.

No. 7. The spider genus *Thymoites* in America (Araneae: Theridiidae). By Herbert W. Levi. 27 pp. 76 figs. Feb. 5, 1964.

No. 8. An annotated checklist and key to the anoline lizards of Cuba. By Rudolfo Ruibal. 48 pp. 18 figs. March 4, 1964.

VOL. 131

No. 1. American spiders of the genus *Episinus* (Araneae: Theridiidae). By Herbert W. Levi. 25 pp. 93 figs. March 4, 1964.

No. 2. Fossils mammals from the Lower Pliocene of Fish Lake Valley, Nevada. By John B. Clark, Mary R. Dawson and Albert E. Wood. 37 pp. 11 figs. March 30, 1964.

No. 3. American spiders of the genus *Phoroncidia* (Araneae: Theridiidae). By Herbert W. Levi. 22 pp. 86 figs. April 30, 1964.

No. 4. The braincase of the Paleozoic elasmobranch *Tamiobatis*. By Alfred S. Romer. 19 pp. 1 pl. April 30, 1964.

No. 5. The taxonomic status of *Heptaxodon* and dental ontogeny in *Elasmodontomys* and *Amblyrhiza* (Rodentia: Caviomorpha). By Clayton E. Ray. 21 pp. 2 figs. May 25, 1964.

No. 6. The skeleton of the Lower Carboniferous labyrinth-

thodont *Pholidogaster pisciformis*. By Alfred S. Romer. 31 pp. 1 pl. May 25, 1964.

No. 7. Early evolution of the dissorophid amphibians. By Robert L. Carroll. 90 pp. 2 pls. June 30, 1964.

No. 8. The genus *Micrathena* (Araneae, Araneidae) in the West Indies. By Arthur M. Chickering. 31 pp. 71 figs. June 30, 1964.

PSYCHE

VOL. 70

No. 2. A new genus of the tribe Mesostenini from Chile (Hymenoptera, Ichneumonidae). By C. C. Porter. Pp. 117-119, June, 1963.

The female of *Bertrana hieroglyphica* Petrunkevitch (Araneae, Argiopidae). By A. M. Chickering. Pp. 129-132, figs. 1-4, June, 1963.

No. 3. A preliminary review of *Zelanophilus* with description of a new Australian species (Chilopoda: Geophilomorpha: Geophilidae). By R. E. Crabbill. Pp. 164-169, Sept., 1963.

The male of *Mecynometa globosa* (O.P.-Cambridge) (Araneae, Argiopidae). By A. M. Chickering. Pp. 180-183, figs. 1-5, Sept., 1963.

Two new North American species of *Hydrovatus*, with notes on other species (Coleoptera: Dytiscidae). By F. N. Young. Pp. 184-192, figs. 1-13, Sept., 1963.

No. 4. A new genus and species of neotropical horsefly (Diptera: Tabanidae). By G. B. Fairchild. Pp. 193-196, figs. 1-3, Dec., 1963.

Mexiterpes sabinus, new genus and new species, a Mexican troglobite (Diplopoda: Trichopetalidae). By Nell B. Causey. Pp. 235-239, figs. 1-3, Dec., 1963.

VOL. 71

No. 1. Remarks on *Sceliotrachelus* Brues and allied genera (Hymenoptera, Platygasteridae). By Lubomir Masner. Pp. 8-11, figs. 1-7, March, 1964.

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VOL. 4

No. 42. The genera *Pedipes* and *Laemodonta* in the Western Atlantic. By W. J. Clench. Pp. 117-127, 1964.

No. 43. The subfamilies Volutinae, Zidoninae, Odontocymbiolinae and Calliotectinae in the Western Atlantic. By W. J. Clench and R. D. Turner. Pp. 129-180, 1964.

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